

Claims

[c1] 1. A process for fabricating metal interconnects, comprising the steps of:

providing a substrate having a dielectric layer and a silicon-containing mask layer over the dielectric layer;

patterning the dielectric layer to form an opening using the silicon-containing mask layer as an etching mask;

forming a metallic glue layer over the silicon-containing mask layer and interior surfaces of the opening;

forming a metallic layer over the substrate to fill the opening and cover the metallic glue layer;

performing a thermal treatment so that the metallic glue layer reacts with the silicon-containing mask layer to form a metal silicide layer;

removing a portion of the metallic layer using the metal silicide layer as an stopping layer so that the metal silicide layer is exposed;

performing a cleaning process to remove the metallic silicide layer; and

removing the silicon-containing mask layer so that the dielectric layer is exposed.

[c2] 2. The process of claim 1, wherein material constituting

the silicon-containing mask layer comprises polysilicon.

- [c3] 3. The process of claim 1, wherein the cleaning process is performed using a solution mixture containing hydrogen peroxide, sulfuric acid, water and hydrofluoric acid.
- [c4] 4. The process of claim 3, wherein ratios of hydrogen peroxide, sulfuric acid and water in the solution mixture is 1 ~ 10: 1 ~ 10: 1 ~ 100.
- [c5] 5. The process of claim 3, wherein a concentration of hydrofluoric acid within the cleaning solution is 1 ~ 20 ppm.
- [c6] 6. The process of claim 1, wherein the step of removing the portion of the metallic layer to expose the metal silicide layer comprises performing a chemical-mechanical polishing operation.
- [c7] 7. The process of claim 1, wherein the step of removing the silicon-containing mask layer to expose the dielectric layer comprises performing a chemical-mechanical polishing operation.
- [c8] 8. The process of claim 1, wherein before forming the metallic glue layer, the process further comprises performing a cleaning process to remove residues from the opening.

- [c9] 9. The process of claim 1, wherein the thermal treatment comprises a rapid thermal annealing operation.
- [c10] 10. The process of claim 1, wherein the thermal treatment is carried out at a temperature smaller than 600°C.
- [c11] 11. The process of claim 1, wherein the metallic glue layer comprises a titanium nitride/titanium composite layer.
- [c12] 12. The process of claim 11, wherein the metal silicide layer comprises a titanium silicide layer.
- [c13] 13. The process of claim 11, wherein the titanium nitride/titanium composite layer has a thickness between about 180Å to 220Å.
- [c14] 14. The process of claim 1, wherein the metallic layer comprises a tungsten layer.
- [c15] 15. A method for removing a metal silicide layer, comprising the steps of:
removing a metal silicide layer using a solution mixture containing hydrogen peroxide, sulfuric acid, water and hydrofluoric acid, wherein ratios of hydrogen peroxide, sulfuric acid and water within the solution is 1 ~ 10: 1 ~ 10: 1 ~ 100 and a concentration of the hydrofluoric acid is 1 ~ 20 ppm.

- [c16] 16. The method of claim 15, wherein the ratio of hydrogen peroxide, sulfuric acid and water within the solution is 7:3:50.
- [c17] 17. The method of claim 15, wherein the concentration of hydrofluoric acid within the solution is 10 ppm.
- [c18] 18. The method of claim 15, wherein the metal silicide layer comprises a titanium silicide layer.